THE MAKING OF BRITAIN.[1]

I HAVE chosen for consideration this evening a subject which may on the one hand be discussed from the purely literary, and on the other from the strictly scientific side, but which is most thoroughly investigated by united research in both directions. I propose to ask your attention to the changes which have taken place in the outward aspect of this country since man first set foot upon its surface, and to the sources of information regarding them. That this subject appeals strongly to the instincts of the lover of science needs not to be insisted upon here. It deals with the evidence for many kinds of geological operations, and with their rate of progress. It may, consequently, be made to throw light upon one of the vexed problems of science—the value of time in geological inquiry. Of its relations to literature I would fain say more, because it seems to me eminently calculated to engage the sympathies and even the active co-operation of literary students. There can be no doubt that the future advancement of our knowledge of this question must depend largely upon help from the literary side.

A generation has hardly passed away since the truth was recognised that man is in large measure the creature of his environment; that his material progress and mental development have been guided and modified by the natural conditions in which he has been placed. The full extent and application of this truth, however, are probably not even yet realised by us. If the surrounding and limiting conditions have been such potent factors in human development, we may well believe that any serious change or modification in them cannot but have reacted upon man. If nature alters her aspect to him, he too will in some measure be affected thereby, and his relations to her will be influenced. What then have been the kind and amount of the mutations in the face of nature since man first appeared? In trying to answer this question I will restrict myself, for the present, to the consideration of the evidence in the case of Great Britain; but it will be understood that the principles laid down for the conduct of the inquiry with regard to this country must be of general application to other regions of the globe.

Let me remark at the outset that considerable progress has been made in the investigation of this question, both from its scientific and its historical side. Lyell, and my revered friend Professor Prestwich, with the geologists who have followed them, have laid a solid foundation of knowledge regarding the later mutations in the physical geography of Britain. Guest, Pearson, Freeman, Green, and others, have shown in how many ways the historical development of the people has been influenced by the topographical features of the country. Yet in spite of all that has been done, I do not hesitate to say that we are still only a little way beyond the threshold of this wide subject. No one has realised more vividly at once the importance of the inquiry and the imperfection of the available data than the late Mr. J. R. Green. He would fain have been able to reconstruct the successive phases through which our landscapes have passed since the dawn of history; and he did more in this respect

[1] *The Changes in the Outward Aspect of Britain since Man appeared in the Country:* an address given in the lecture-hall of the University Museum, Oxford, on March 1st, 1887.

alone with a baby! They were all so took up with the young woman (my mother was a very personable young woman) they never noticed she was on "Lady," though there must have been lots as knew Standard's mare well enough.

Mother was dead tired; and I was asleep, as comfortable as I am now by this fire.

She rides straight up to the post-office, and one of the chaps lifts her down; but she wouldn't let one on 'em touch the mail-bags, but drags them off herself, and says, standing on the doorstep with me in her arms, and the mails at her feet: "If you please, gentlemen, I've brought in the mails. The gentleman lent me his horse. I was lost; and will you send a horse to meet him. He's walking from the fern-gully. And 'Lady' is to be seen to, please." And then she drops down on the step pretty nigh done.

The chaps set to and cheered her—cheer after cheer, till mother was drawn in out of the noise by the post-master's wife, who told 'em they ought to know better than make a lady so shamefaced, so tired as she was, too. The old lady was quite as astonished as any of them, for all she said to the chaps to hold their noise; and quite proud to have the first hearing of it all from mother, as she put her and me to bed in her own room. Well, the end of it was, Standard he was met right enough, and brought in the next afternoon. But they never found my poor father and his chum—not till months after, and then it was bones they found. Mother, she stayed on, and helped the post-mistress at Gundaroo, who was getting oldish.

So that's how a woman brought her Majesty's mails into Gundaroo; and *that's* why I'm called Het.

Don't see why? Oh! I forgot to say that when I was christened, a month or so after, mother called me after Standard, as had saved us both. Didn't I tell you his name was Hector? --Het, for short. Het Standard, he was: I'm Het Bannerman; but mother, she is Mrs. Het Standard now, post-mistress of Gundaroo. I dessay you guessed as much.

with his materials than probably any other living man could have done. But the detailed evidence was wanting to him ; and it has still to be gathered before the ideal of the historian can be reached. Now, I am desirous of insisting upon the fact that this detailed evidence does not lie shut up from the reach of all but the practised man of science and the mature historian. Much of it, whether in the literary or scientific domain, may be gleaned by any young undergraduate who will bring to the task quickness of observation and accuracy of judgment. As the harvest is abundant but the labourers few, I would fain enlist the sympathy and co-operation of any who may be able and willing to help.

For the sake of clearness, I will divide my remarks into two portions. The first of these will deal with the nature and sources of the evidence from which we know that the outer aspect of the country has undergone many vicissitudes : the second will be devoted to the character of the changes themselves.

I. There are four obvious sources of information regarding former conditions of the land. First comes the testimony of historical documents, then that of place-names, next that of tradition, and, lastly, that of geological evidence.

(1) One might suppose that for what has taken place during the historical period, the evidence of history would be all sufficient. But it is only recently that the subject has been determined to be worthy of the historian's serious attention, and hence we cannot look for much light to be thrown upon it in the pages of the ordinary histories. Nor need we expect to meet with any full measure of information regarding it in the original documents from which these histories are compiled. In truth, the facts of which we are in search must be gleaned from brief allusions and implications rather than from actual descriptions. It was no part of the duty of an old chronicler purposely to record any natural fact, short of some terrific earthquake or storm that destroyed human life and damaged human property. But in describing historical events he could hardly avoid reference to woods, lakes, marshes, and other natural features which served as boundaries to the theatre of these events. By comparing, therefore, his local topography with the present aspect of the same localities, we may glean some interesting particulars as to changes of topography in the course of centuries. Such a comparison, however, to be effective and trustworthy, involves two special qualifications. The inquirer must be a thorough master of the language and style of the author he is studying, and he must be completely familiar with the present condition of the ground to which allusion is made. The want of this combination of knowledge has led to some curious blunders on the part of able scholars.

It is evident, then, that a vast domain of research is here opened out to the student. In a general sense, every historical document may be available for the purposes of the inquiry. Besides the narratives of the old Chronicles, which might be expected to contain at least occasional incidental reference to physical features, much information may be gleaned from quarters that might be thought the most unlikely. Charters and other legal documents, in dealing with the holding and transference of land, not infrequently throw light on the former aspect of the ground with which they are connected. The Cartularies of some of our ancient abbeys, besides affording glimpses into the inner life of these establishments, which do not seem to have been always abodes of peace and studious retirement, give indications of the former areas of forest, woods and mosses, or the positions of lakes now reduced in size or effaced. Old Acts of Parliament, looked at from our present point of view, are by no means always repulsive reading.

They have one great advantage over their modern representatives in that they are often commendably brief, and in their occasional quaint local colouring, they afford material for interesting comparison with existing topography.

Among historical documents I include poems of all kinds and ages. Our earliest English literature is poetical; and from the days of Caedmon down to our own time, the typical characters of landscape have found faithful reflection in our national poetry. It is not merely from what are called descriptive poems that information of the kind required is to be gathered. The wild border-ballad, full of the rough warfare of the time, has a background of bare moorland, treacherous moss-hags, and desolate hills, which can be compared with the aspect of the same region to-day. The gentler lyrics of a later time take their local colouring from the glades and dells, the burns and pastures where their scenes are laid. In the stately cadence of the *Faery Queen* among the visionary splendours of another world the rivers of England and Ireland are pictured, each with its characters touched off as they appeared in the days of Elizabeth. And in Drayton's quaint, but somewhat tiresome *Polyolbion*, abundant material is supplied for a comparison between the topography of England at the beginning of the seventeenth century and that of our own time.

But these comparisons have still to be worked out. As an example of the kind of use that may be made of them, and of the light which our poetry may cast, not only upon physical changes, but upon historical facts, I would refer to the passages in Barbour's poem of *The Bruce* descriptive of the Battle of Bannockburn. I do not mean to contend for the historical veracity of the Archdeacon of Aberdeen, though I think he hardly deserves the sweeping and contemptuous condemnation meted out to him by Mr. Green. As he was born only some two years after the battle, as he had travelled a good deal, and as the field of Bannockburn lay across the land-route from the north to the south of Scotland, we may believe him to have made himself personally acquainted with the ground. At least, he could easily obtain information from many who had been themselves actors in the fight. He had no object to gain by drawing on his imagination for the local topography, more especially as his little bits of local description were not in any way required for the glorification of his hero. I think, therefore, that when Barbour describes a piece of ground, we may take his description as accurately representing the topography at least in his own day; and it could hardly have changed much in the generation that had passed since the time of Bruce. Now, many persons who have visited the site of the Battle of Bannockburn have felt some difficulty in understanding why the English army did not easily outflank the left wing of the Scots. At present, a wide fertile plain stretches for miles to the north and south of the low plateau on which Bruce's forces were drawn up. A small body of the English cavalry did, indeed, make its way across this plain until overtaken and cut to pieces by Randolph. But why was this force so easily dispersed, and why was no more formidable and persistent effort made to turn that left flank? It is very clear that, had the topography been then what it is now, the Battle of Bannockburn must have had a far other ending.

The true explanation of the difficulty seems to me to be supplied by some almost casual references in Barbour's account of the operations. He makes Bruce, in addressing his followers, allude to the advantage they would gain should the enemy attempt to pass by the morass beneath them. The poet further narrates how the Carse, that is, the low flat land on the left, was dotted with pools of water: how the English, in order to effect a passage, broke down houses, and tried to

bridge over these pools with doors, windows, and thatch from the cottage roofs; and how, with the assistance of their compatriots in Stirling Castle, they were so far successful that Clifford's troop of horse, and, possibly, some more of the English army, got safely over to the hard ground beyond. We thus learn that Bruce's famous device of the "pots" was only an extension of the kind of defence that nature had already provided for him. The ground on his left, now so dry and so richly cultivated, was then covered with impassable bogs and sheets of water; and the huge army of Edward was consequently compelled to crowd its attack into the narrow space between these bogs and the higher grounds on Bruce's right.

(2) Another wide field of inquiry for information touching changes in the aspect of the country is supplied by the etymology of place-names. These names, at least those of them that date from old times, possess a peculiar value and interest as abiding records of the people who gave them, and also, in many cases, of the circumstances in which they were given. We are at present concerned only with those that embody some physical fact in the topography. Many of these are as appropriate now as they were at first; for the features to which they were applied have remained unaltered. Ben Nevis is as truly the "Hill of Heaven" today as when the earliest Celtic tribe looked up to it from the glens below. The big stones on the summit of Penmaenmawr still stand as memorials of the British people who erected and named them.

But in innumerable instances the appositeness of the designation has been lost. The name has, in fact, been more permanent than the feature to which it was applied. The one has survived in daily speech from generation to generation: the other has wholly passed away. By comparing the descriptive epithet in the name with the present aspect of the locality, some indication, or even, perhaps, some measure of the nature and amount of the changes in the topography, may still be recovered.

Now in researches of this kind the liability to blunder is so great, and many able writers have blundered so egregiously, that the inquiry ought not to be entered upon without due preparation, and should not be continued without constant exercise of the most scrupulous caution. The great danger of being betrayed into error by the plausibilities of phonetic etymology should never for a moment be lost sight of. Where possible the earliest form of the name should be recovered, for in the course of time local names are apt to be so corrupted as to lose all obvious trace of their original orthography.

The Celtic place-names are as a whole singularly descriptive. The Celtic tribes, indeed, have manifested, in that respect, a keener appreciation of landscape and a more poetical eye for nature than their Saxon successors. Who that has ever stood beneath the sombre shadow of the cloud that so often rests on the shoulders of the Grampians will fail to recognise the peculiar fitness of the Gaelic name for the highest summit of the chain—Ben-na-muich-dubh, "the mountain of dark gloom"? Or who has ever watched the Atlantic billows bursting into white foam against the cliffs of Ardnamurchan and did not acknowledge that only a poetic race could have named the place "the headland of the great sea." The colours of mountain and river have been seized upon by these people as descriptive characters that have suggested local names. Swiftness and sluggishness of flow have furnished discriminating epithets for rivers. Moors, forests, woodlands, copses, groups of trees, solitary bushes, lakes, mosses, cliffs, gullies, even single boulders, have received names which record some aspect or character that struck the imagination of the old Celt. Many of these names have never found a place on any map, but they are well

known to the Welsh and Gaelic inhabitants who in the more mountainous and trackless regions have often a wonderful acquaintance with the details of the topography.

Here, then, in the Celtic place-names of the country lies a wide and practically as yet untouched domain for exploration. Civilisation has advanced less rapidly and ruthlessly in the Celtic-speaking parts of the country. In these districts, too, there are fewer historical records of progress and change. But the topographical names when carefully worked out will doubtless supply much information regarding former aspects of the country. Taken in connection with a minute examination of the present topography, they may be found to preserve a record of former conditions of surface whereof every other memorial has for ever perished.

Our Saxon progenitors, also, gave appropriate local names; but with a sturdy self-assertion, and prosaic regard for plain fact, they chose to couple their own *cognomina* with them. If a settler fenced in his own inclosure he called it his "ton" or his "ham." If he felled the trees of the primeval woodlands and made his own clearance, it became his "fold." If he built himself a mud cottage it was his "cote," or if he attained to the dignity of a farm he called it his "stead." As he and his brethren increased their holdings and drew their houses together for companionship and protection, the village kept their family name. But besides these patronymic epithets, which are of such value in tracing out the early settlement of the country, the English gave more or less descriptive local names. In their "holts" and "hursts," "wealds" and "shaws," we can still tell where their woods lay. In their "leighs," "fields," and "royds," we can yet trace the open clearings in these woods. But for the broad landmarks and larger natural features of the country, the Saxons were generally content to adopt, in some more or less corrupted form, the names already given by the Celtic tribes who had preceded them.

(3) As another but less reliable source of information regarding alterations in the surface of the country, I would make brief allusion to the subject of local tradition. In these days of education and locomotion, we can hardly perhaps realise how tenacious, and on the whole faithful, the human memory may be in spite of the absence of written or printed documents. Even yet we see the unbroken and exact record of the true boundaries of a parish or township handed down in the annual beating of the bounds or riding of the marches. And even where no such ceremony has tended to perpetuate the remembrance of topographical details, tradition, though it may vary as to historical facts, is often singularly true to locality. I am tempted to give what seems to me a good example of this fidelity of tradition. Many years ago among the uplands of Lammermuir I made the acquaintance of an old maiden lady, Miss Darling of Priestlaw, who with her bachelor brothers tenanted a farm which their family had held for many generations. In the course of her observant and reflective life she had gathered up and treasured in her recollection the traditions and legends of these pastoral solitudes. I well remember, among the tales she delighted to pour into the ear of a sympathetic listener, one that went back to the time of the Battle of Dunbar. We know from his own letters in what straits Cromwell felt himself to be when he found his only practicable line of retreat through the hills barred by the Covenanting army, and how he wrote urgently to the English commander at Newcastle for help in the enemy's rear. It has usually been supposed that his communications with England were kept up only by sea. But the weather was boisterous at the time, and a vessel bound for Berwick or Newcastle might

have been driven far away from land. There is therefore every probability that Cromwell would try to send a communication by land also. Now the tradition of Lammermuir maintains that he did so. The story is told that he sent two soldiers disguised as natives of the district to push their way through the hills and over the border. The men had got as far as the valley of the Whiteadder, and were riding past the mouth of one of the narrow glens, when a gust of wind, sweeping out of the hollow, lifted up their hodden-grey cloaks and showed their military garb beneath. They had been watched, and were now overtaken and shot. Miss Darling told me that tradition had always pointed to an old thorn-bush at the opening of the cleugh as the spot where they were buried. At her instigation the ground was dug up there, and among some mouldering bones were found a few sorely decayed military buttons with a coin of the time of Charles the First.

Tradition is no doubt often entirely erroneous; but it ought not, I think, to be summarily dismissed without at least critical examination. There are doubtless instances where it might come in to corroborate conclusions deducible from other and usually more reliable kinds of evidence.

(4) But of all the sources of information regarding bygone mutations of the surface of the land, undoubtedly the most important is that supplied by the testimony of geology. Early human chronicles are not only imperfect, but may be erroneous. The chronicle, however, which Nature has compiled of her past vicissitudes, though it may be fragmentary, is, at least, accurate. In interpreting it the geologist is liable, indeed, to make mistakes; but these can be corrected by subsequent investigation, while the natural chronicle itself remains unaffected by them. Moreover, it embraces a vast period of time. Historical evidence in this country is comprised within the limits of nineteen centuries. The testimony from Celtic topographical names may go back some hundreds of years further. But the geological record of the human period carries us enormously beyond these dates. Hence, in so vast a lapse of time, scope has been afforded for a whole series of important geological revolutions. On every side of us we may see manifest proofs of these changes. The general aspect of the country has been altered, not once only, but many times. The agencies that brought about these changes have, in not a few instances, preserved tolerably complete memorials of them. We are thus enabled to trace the history of lakes and rivers, of forests and mosses: we can follow the succession and migrations of the animals that have wandered over the land, and many of which had died out ere the days of history began: we can dimly perceive the conditions of life of the earliest human population of the country: we can recover abundant evidence of the extraordinary vicissitudes of climate which since these ancient times have affected, not this land only, but the whole northern hemisphere.

II. I come now to the second division of my subject—the character of the changes in the general aspect of Britain since man first appeared in the country. It must be obvious that only the very briefest outline of this wide range of topics is possible here. My object will be gained, however, if I can present such a rapid sketch as will show the general nature of the changes and indicate the lines along which further inquiry is needed. Much earnest investigation in all the kinds of research which I have enumerated will be required before anything like a completed picture can be given of the successive geographical phases which man has witnessed here.

Let us then try to raise a little the curtain of obscurity that hangs over that far-off time when the earliest human inhabitants found their way to this region. The first and most memorable feature in the topography

of that dim antiquity is one about which there can hardly be any doubt. Britain was not yet an island. The downs of Kent ran on across what is now the Strait of Dover, and joined the downs of Picardy. A large tract of the bed of the North Sea, all the southern part at least, was then dry land—a wide plain, across which the Thames meandered northward to join the Rhine. Whether Ireland had already been separated from the rest of Britain has not yet been ascertained; but England and Scotland were parts of the continent, and prolonged the dry land of Europe boldly westward into the Atlantic Ocean. It was over these downs now lost, and across these plains now submerged beneath the sea, that the first human population entered our region. Judged by the relics they have left behind them of their handiwork, these earliest Britons must have been a race of rude savages, fashioning their weapons and tools out of flint and out of the bones of the animals they killed in the chase: clad in skins, living in caves, rock-shelters, and holes dug in the earth; and waging incessant warfare, if not with each other, at least with a host of wild beasts of the field, and with a climate more inclement than any now to be found within the bounds of Europe.

At the time of its greatest rigour, the climate of the north-west of Europe, during these remote ages, resembled that of northern Greenland at the present day. Vast fields of ice and snow lay over all the northern and central parts of Britain. One wide glacier, descending from Scandinavia, extended across the site of the North Sea, and, joining the English ice, advanced southward nearly as far as London. The ice that streamed off the west of Scotland and Ireland went out into the Atlantic as one widely-extending wall which cumbered the ocean with icebergs. The only part of the country not then invaded by the northern ice, and, therefore, habitable by man, was the southern strip that stretched from France and the mouth of the Thames to the Bristol Channel. But so great was the cold of winter that the ground in that southern tract was probably frozen hard for some depth, and only melted at the surface in summer. The rapid thawing of the snows in warm weather gave rise to floods that swelled the streams and deluged the surface of the country. Truly a most inhospitable time! One might well wonder what could have brought even the most forlorn race of men to these forbidding and ice-bound shores. But, in all probability, man was in the country before the climate became so severe, and was gradually driven southward by the increase of the cold and the advance of the ice.

Of the animals that were contemporaneous with man during these dreary centuries some relics have been preserved. We know that the reindeer wandered over the west of Europe as far, at least, as the south of France. The musk-sheep, too, the glutton, the arctic fox, the lemming, and other truly northern forms of life, pushed southward by the advance of the ice-fields, roamed over Britain and central Europe. With these still living species others appeared which have long been extinct, such as the hairy mammoth and the woolly rhinoceros, both of which have left their bones in many parts of the south of England.

But the temperature was not continuously arctic. There came intervals of milder seasons, when the ground thawed, and the snow disappeared, and the glaciers shrank away northward. During these more congenial periods, animals of temperate and southern climes found their way into the west and north. In the valley of the Thames, for instance, elephants and rhinoceroses browsed on luxuriant herbage. Among the glades, on either side, the stag and roe and the huge-antlered Irish elk found ample pasturage. Herds of wild urus and bison moved across the plain; and in the woods the brown bear, the grizzly bear, and the wild boar found a home. In the wake of this abundant animal

life came the carnivora that preyed upon it. Among the sounds familiar to human ears all along the valley were the nightly roar of the lion, the yell of the wild cat, the howl of the hyæna, and the bay of the wolf. The river itself teemed with life. In its waters the African hippopotamus gambolled and the beaver built his dams.

Slow secular changes that influenced the climate once more brought back the cold, and drove southward this abundant animal life. As the snow and ice returned, the contest between frost and warmth gave rise to floods that swept across the frozen ground and strewed it with loose deposits, among which human implements and the bones of animals, both of northern and southern types, were mingled together. How far these animals were really coeval in the country, or whether their apparent association is not the result of the accidental mixing up of their remains, is an interesting problem not yet solved. Indeed, the story of what are called the "valley-gravels" is still very imperfectly understood, and offers many attractions to the enthusiastic observer.

Let us now come down the stream of time, across the long series of centuries that intervened between the Ice Age and the beginning of history, and look at the aspect presented by the country when the Romans entered it nineteen hundred years ago. What a momentous change had in this long interval passed over it! First and most important of all, Britain was no longer a part of the continent, but had become an island, separated then, as now, by a strip of rough sea-channel from the nearest part of Europe. The climate, too, had changed: snow-fields and glaciers had vanished: the summers and winters had become much what they are still. Of the characteristic animals, some had disappeared others had become rare. The lion, hyæna, rhinoceros, elephant and hippopotamus, for instance, had retreated to more southern latitudes; but the wolf, brown ear, and wild boar still haunted the forests. The early tribe of men, too, who made the flint weapons found in the valley-gravels, had been driven away or been swallowed up by successive waves of immigrants from the great family of the Celts, who were now the dominant race in these islands.

In trying to account for such great changes in the character of the outer aspect of Britain, a wide range of investigation opens out to us, wherein but little progress has yet been made. For example, what were the circumstances under which Britain became an island? That this geological revolution was mainly due to a subsidence of the region can hardly be doubted. To this day, between tide marks, or below low water, we can still see the stumps of trees standing where they grew, and beds of peat containing nuts and other vestiges of a land vegetation. These "submerged forests" are proofs of a comparatively recent sinking, and are, no doubt, to be regarded as relics of the general mantle of wood and bog that covered the country at the time of the downward movement. The floor of the North Sea still preserves many of the features which must have marked the former wide terrestrial plain that occupied its site. From the headlands of Yorkshire the line of cliff is prolonged as a steep submarine bank for many miles towards the coast of Denmark, broken by two gorges or valleys, in the westmost of which may have flowed the Thames, while the eastmost gave passage to the Rhine. Was the subsidence slow and tranquil, or was it sudden, and accompanied with waves of disturbance that devastated the lower grounds of western Europe?

The last connecting link between Britain and the continent was probably the line of chalk-ridge between Dover and Calais. There is some reason to surmise that it survived the submergence of the northern plain. Along this narrow ridge the earliest Celtic immigrants may have made their way. Its ultimate disappearance is probably referable rather to

erosion at the surface than to underground movements. Attacked on the one side by the breakers driven against it by the south-western gales from the Atlantic, and on the other by those of the North Sea, it would eventually be cut through. When once the tides of the two seas united, their progress for a time would be comparatively rapid in sawing down the soft chalk, in widening for themselves a passage and deepening it as far as the downward limit of their erosive power. But to this day the narrows of the strait remain so shallow that, as has often been said, St. Paul's Cathedral, if set down there, would rise half out of the water.

Since the subsidence of the great plain, other manifestations of underground energy have shown themselves within the British area. Some portions of the land have been elevated, and in the selvage of uplifted coastline relics of the human occupants of the country have been found. In other places, renewed depression has been suspected to have occurred. But the evidence for these upward and downward movements deserves further careful investigation both from the geological and the historical side.

Though on the whole singularly free from those more violent exhibitions of subterranean activity which, as within the last few days, have carried death and destruction far and wide through some of the fairest regions of the earth's surface, Britain has from time to time been visited by earthquakes of severity enough to damage public buildings. The cathedral of St. David's, in its uneven floor and dislocated walls, still bears witness to the shock which six hundred years ago did so much injury to the churches of the west of England. But though a formidable catalogue has been drawn up of the earthquakes experienced within the limits of these islands, it is not to that kind of underground disturbance that much permanent alteration of the surface of the country is to be attributed.

At the dawn of history the general appearance of this country must have presented in many respects a contrast to that which we see now; and notably in the wide spread of its forests, in the abundance of its bogs and fens, and (through the northern districts) in the prodigious number of its lakes.

At the first coming of the Romans by far the larger part of the country was probably covered with wood. During the centuries of Roman occupation some of the less dense parts of the woodland were cleared. In driving their magnificent straight highways through the country, the Roman legionaries felled the trees for seventy yards on each side of them to secure them from the arrows of a lurking foe. So stupendous was the labour involved in this task, that they gladly avoided forests where that was possible, and sometimes even swung their roads to right or left to keep clear of these formidable obstacles. For many hundreds of years after the departure of the legions, vast tracts of primeval forest remained as impenetrable barriers between different tribes. In these natural fastnesses the wolf, brown bear, and wild boar still found a secure retreat. Even as late as the twelfth century the woods to the north of London swarmed with wild boars and wild oxen. Everywhere, too, the broken men of the community betook themselves to these impenetrable retreats, where they lived by the chase, and whence they issued for plunder and bloodshed. The forests were thus from time immemorial a singularly important element in the topography. They have now almost entirely disappeared, and their former sites have as yet only been partially determined, though much may doubtless still be done in making our knowledge of them more complete.

In connection with this subject it should be remembered that, in many instances, the areas of wood and open land have in the course of generations

completely changed places. The wide belts of clay-soil that sweep across the island, being specially adapted for the growth of trees, were originally densely timbered. But the process of clearance led to the recognition of the fact that these clay-soils were also eminently fitted for the purposes of agriculture. Hence, by degrees, the sites of the ancient forests were turned into corn-fields and meadows. On the other hand, the open tracts of lighter soil, where the earlier settlers established themselves, were gradually abandoned, and lapsed into wastes of scrub and copsewood.

The fens and bogs of Britain played likewise a large part in the attack and defence of the country in Roman and later times. They were of two kinds. One series lay on the coast, especially in sheltered inlets of the sea, and were liable to inundation by high tides. The most notable of these was the wide tract of low, swampy land at the head of the Wash, our Fenland—an area where, secure in their amphibious retreats, descendants of the Celtic population preserved their independence not only through Roman but through Saxon times, if indeed, as Mr. Freeman conjectures, outlying settlements of them may not have lingered on till the coming of the Normans. The other sort of fens were those formed in the interior of the country by the gradual encroachment of marshy vegetation over tracts previously occupied by shallow sheets of fresh water and over flat land. It was in these swamps that the Caledonians, according to the exaggerated statement of Xiphiline, concealed themselves for many days at a time, with only their heads projecting above the mire. At a far later time the peat-bogs of the debateable land between England and Scotland formed an important line of advance and retreat to the freebooters of the border, who could pick their way through sloughs that to less practised eyes were impassable.

One of the distinguishing features among the topographical changes of the last few hundred years has been the disappearance of a vast number of these fens and bogs. In some cases they have been gradually silted up by natural processes; but a good many of them have no doubt been artificially drained. Their sites are still preserved in such Saxon names as Bogside, Bogend, Mossflats; and where other human record is gone, the black peaty soil remains to mark where they once lay. It would not be impossible with the help of such pieces of evidence and a study of the present contours of the ground to map out in many districts, now well drained and cultivated, the swamps that hemmed in the progress of our ancestors.

No one looking at the present maps of the north of England and Scotland would be led to suspect what a large number of lakes once dotted the surface of these northern regions. Yet if he turns to old maps, such as those of Timothy Pont, published some three hundred years ago, he will notice many sheets of water represented there which are now much reduced in size or entirely replaced by cultivated fields. If, farther, he scans the topographical names of the different counties, he will be able to detect the sites of other and sometimes still older lakes; while, if he sets to work upon the geological evidence by actual examination of the ground itself, he will be astonished to find how abundant at comparatively recent times were the tarns and lakes of which little or no human record may have survived, and often how much larger were the areas of the lakes that still exist. Owing to some peculiar geological operations that characterised the passage of the Ice Age in the northern hemisphere, the land from which the snow-fields and glaciers retreated was left abundantly dotted over with lakes. The diminution and disappearance of these sheets of water is mainly traceable to the inevitable process of obliteration which sooner or later befalls all lakes great and small. Detritus is swept into them from the surrounding slopes and shores. Every brook that enters

them is engaged in filling them up. The marsh-loving vegetation which grows along their shallow margins likewise aids in diminishing them. Man, too, lends his help in the same task. In early times he built his pile-dwellings in the lakes, and for many generations continued to cast his refuse into their waters. In later days he has taken the more rapid and effectual methods of drainage, and has turned the desiccated bottoms into arable land.

Nor have the changes of the surface been confined to the interior of the country. Standing as it does amid stormy seas and rapid tidal currents, Britain has for ages suffered much from the attacks of the ocean. More especially has the loss of land fallen along our eastern shores. Ever since the submergence of the North Sea and the cutting through of the Strait of Dover, the soft rocks that form our sea-board facing the mainland of Europe have been a prey to the restless waves. Within the last few centuries whole parishes, with their manors, farms, hamlets, villages, and churches have been washed away; and the fisherman now casts his nets and baits his lines where his forefathers ploughed their fields and delved their gardens. And the destruction still goes on. In some places a breadth of as much as five yards is washed away in a single year. Holderness, once a wide and populous district, is losing a strip of ground about two and a quarter yards broad, or in all about thirty-four acres annually. Its coast-line is computed to have receded between two and three miles since the time of the Romans—a notable amount of change, if we would try to picture what were the area and form of the coast-line of eastern Yorkshire at the beginning of the historic period.

But though the general result of the action of the sea along our eastern border has been destructive, it has not been so everywhere. In sheltered bays and creeks some of the material, washed away from more exposed tracts, is cast ashore again. In this way part of the mud and sand swept from off the cliffs of Holderness is carried southward into the Wash, and is laid down in that wide recess which it is gradually filling up. Along the coasts of Norfolk and Suffolk inlets which in Roman and later times were navigable channels, and which allowed the ships of the Danish Vikings to penetrate far into the interior of the country, are now effaced. On the shores of Kent, also, wide tracts of low land have been gained from the sea. Islands, between which and the shore Roman galleys and Saxon war-boats made their way, are now, like the Isle of Thanet, joined to the mainland. Harbours and towns, like Sandwich, Richborough, Winchelsea, Pevensey, and Porchester, which once stood at the edge of the sea, are now, in some cases, three miles inland. There appears also to have been a curious gain of land on the south coast of Sussex, which has considerably altered the physical geography of that district. The valleys by which these downs are trenched were formerly filled with tidal waters, so that the ancient camps, perched so conspicuously on the crest of the heights, could not communicate directly with each other except by boat. Instead of being a connected chain of fortifications as was once supposed, they must have been independent strongholds, surrounded by water on three sides, and on the north by dense forest and impassable morasses.

But the enumeration of the minor changes of surface might be indefinitely extended. Let me only add, in conclusion, that what I have tried to say generally for the whole country must be worked out for each district. A large amount of information still remains to be gleaned; and though our knowledge of the past must always be fragmentary, it need not continue to be so vague and imperfect as it is now. The field is a wide one, where many workers are needed, and where the active co-operation of the young is especially welcome.

ARCH. GEIKIE.